

*Original Research*

# Factors Affecting Productivity Management and its Improvement Strategies in Government Service Organizations

Nasrin Jamshidi<sup>ID</sup> and Masoud Ahmadi<sup>1 ID</sup>

Department of Public Management, Islamic Azad University, Sari Branch,  
Sari, Iran

Ali Farhadi Mahalli<sup>ID</sup>

Department of Public Administration, Islamic Azad University, Gorgan  
Branch, Gorgan, Iran

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## Abstract

This study aims to identify the factors affecting productivity management and rank its improvements within government service organizations. In terms of the type of data, this is a descriptive, applied, and inferential survey, and it is both qualitative and quantitative. This paper follows a three-step process. The theoretical sampling method was thus used to select a sample of 15 productivity experts from within the university and managers from government organizations in Tehran province for semi-structured interviews. It is a specialized sampling method. The interviews were analyzed using NVivo Plus software. Additionally, 102 items were derived from the interviews, based upon open coding, and classified into 21 sub-indexes and two main indices. As part of the second stage, the quantitative aspect of the research, Shannon Entropy, was used to determine the importance of various factors affecting productivity management. The third stage of ranking productivity improvement strategies in public service organizations utilized the MABAC method. The results showed that the indices of accountability, work experience, interdepartmental challenge, expertise and skill, flexibility, interdepartmental communication, training, workload, structure transparency, information and communication technology, organizational culture, safety and health, research and development, leadership style, innovation, and creativity, respectively, gained the highest degree of importance among the factors affecting the productivity management of government service organizations. Further, research findings indicate that improving service efficiency, improving service standards, improving service effectiveness, developing a program to improve service productivity, encouraging leadership involvement, and establishing periodic monitoring are the most effective strategies for improving productivity in government service organizations.

**Keywords:** Productivity Management, Productivity Improvement, Strategy, Service Organizations

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<sup>1</sup> Corresponding author's Email: [m.ahmadi4502@gmail.com](mailto:m.ahmadi4502@gmail.com)

## Introduction

The concept of productivity is a broad one, and it is often described in terms of an intellectual process that aims to be continuously improved (AminiKhiabani & Hamdi, 2018). Therefore, productivity is understood as a conceptual concept whose increase has always been viewed by politicians, economists, and government officials as a necessity to improve living standards, greater welfare, and peace and comfort within society. (Chen et al., 2006). Efficiency and effectiveness are often used to define productivity in studies. Efficiency is defined as the right things that are done; however, effectiveness simply emphasizes that productivity concerns the right things, whereas effectiveness addresses the right ways in which they are done. Efficiencies are essentially a function of input-output conversion. Therefore, productivity is a relative concept in which a service unit's performance must be compared with standards, and effectiveness is at the core of those standards (Gumah & Aziabah, 2020). Improving productivity involves optimizing resource utilization, reducing labor costs, expanding markets, increasing employment, and increasing real wages rather than nominal wages. (Khaki, 2018).

However, service organizations are recognized as the largest and fastest-growing sectors in the economy (Sahay, 2005). Although productivity management plays a key role in service organizations, Robert and Peter (2004) point out that there has been a relatively little empirical study on the subject. (Robert & Peter, 2004). Sahay (2005a) contends that productivity management has its origins in mass production; as a result, productivity issues are mainly addressed in the context of mass production. This may account for the long-term neglect of productivity issues in the service sector. Rutkauskas and Paulavičienė state in 2005 that organizations providing services should approach productivity in a dual organization-customer perspective rather than from a traditional organizational perspective. A broader approach may facilitate the reconciliation between improving service quality and increasing productivity (Rutkauskas & Paulavichiene, 2005). On the other hand, public sector productivity has long been considered one of the most important and challenging issues facing the public sector. The public sector is constantly seeking ways to increase productivity. In Iran, productivity is stressed in policies and macro programs (DanaeeFard & Harati, 2014). During the past few decades, service organizations in Iran have played an important role in the success or failure of the production system. Improving their productivity greatly impacts the country's economy and quality of life.

Furthermore, Iranian society has witnessed profound and dramatic changes in myriad fields over the past few decades. These changes have affected governments by increasing pressures to make them more productive (Faghihi & MousaviKashi, 2010). Despite the lack of official statistics on public sector productivity in Iran, the high share of labor in this sector and the opinion of many experts on the significance of manpower in public sector productivity suggest that the public sector productivity of the country is not favorable. By statistics published by the Asian Productivity Organization in 2018, Iran ranked eighth in labor productivity (per employee). According to these statistics, Iran is experiencing a decline in labor productivity compared to Asian countries; during the 70s, the country was the most productive among Asian countries, such as Japan, Singapore, and Hong Kong (AsianProductivityOrganization, 2018). The problem with management is that most managers make their employees aware of performance problems, but it is

more efficient to help them identify why these problems exist. In other words, many managers excel at identifying the problem. Still, they are usually incompetent at analyzing and diagnosing it, which is crucial before improving productivity. To achieve this goal, managers must identify the root cause of the problem. Accordingly, it would appear that an analysis of ideas and perspectives to identify factors affecting productivity management and evaluate strategies for its improvement in government service organizations could create a positive impression of the organization among various segments of society. The organization's requirements to provide high-quality services and attention to the diversity of services, the use of modern technology in service, and dynamism and differentiation of services make the client's satisfaction with the organization considerably higher, causing the organization to "do the right thing" and "do the right things." For the preliminaries and thematic plan presented, the poor condition of productivity management in many government organizations, and the lack of research to explore productivity management improvement strategies in government service organizations, the current paper addresses the parameters that play a major role in product management in government services. Furthermore, this paper poses the question, "with what priorities and delays can we improve it?"

Presented in this paper are the theoretical foundations and a literature review. The research methodology, including the research type, population, and sampling method, is described. In the end, the conclusions and research suggestions are given, having outlined the research findings.

### **Theoretical foundations and research background**

There are two main definitions of productivity according to research: the first is the ratio of output (such as goods and services produced) to data (labor, materials, energy, etc.); in other words, to maximize output while minimizing data. Second, efficiency and effectiveness are combined. Efficiency can be defined as doing things right; this implies that results are obtained at the lowest cost and with the greatest added value. Effectiveness also means doing the right thing; that is, the goals set are properly chosen (Loeppke et al., 2009). The term service also refers to all the things that a business does to enable customers to receive the maximum benefit from the products and services they have purchased (Rosta et al., 2016). The material characteristics of goods can be described accurately, whereas services have distinct characteristics such as immateriality, inability to store, and synchronization of production and consumption (Rosta et al., 2016). A study conducted by Manvarian et al. in 2005 states that customer service comprises all measures that facilitate the satisfaction of customers' needs (Manavarian et al., 2005). As Kotler et al. stated in 2007, service can also be defined as an activity or benefit that one party provides to another. The service is essentially intangible, and no ownership is involved (Kotler et al., 2007). Therefore, the service can be either physical or non-physical. There are many service definitions in service literature, but generally, they all have some common features like diversity, inseparability, intangibility, and non-storage (Armstrong & Cutler, 2011). Several studies use efficiency, effectiveness, and allocation to define service productivity. Efficiencies and effectiveness can be explained simply by emphasizing that productivity refers to the right things being done, whereas effectiveness refers to doing the right things. Efficiency refers to the efficiency of processes for converting inputs into outputs. Accordingly, productivity is a relative concept in which

the performance of an entity is measured against established standards, and effectiveness is the foundation of established standards (Gumah & Aziabah, 2020).

To enhance the efficiency of services provided, policymakers are responsible for making decisions that have consequences such as efficiency and the design of remedial strategies. The responsibility for strategic management falls to government managers. Consequently, serving the people, citizen participation, and government as democratic ideals must take precedence in public administration. As such, government managers must develop policies that meet and even shape public needs and wants (Denhardt & Denhardt, 2003). Andrews and Entwistle (2004) argue that productivity in the public sector is about minimizing costs and maximizing output and the quality of output and who will be receiving better quality or more output (Andrews & Entwistle, 2014). According to Forsund, productivity is the total demand for services and the supply of services. If citizens value the goods and services produced, that matters. Even if a service is technically very effective, it may indicate inefficient resource allocation if it is not what people want it to be (Forsund, 2017). Andrews and Entwistle (2014) provide an objective example in this context. A passenger bus or a library without a reader may indicate a misallocation of publicly owned resources (Andrews & Entwistle, 2014). The value of a library or bus is understood by citizens, which justifies continued funding. Therefore, the law of supply and demand does not always apply in public administration. A simplified definition of service productivity can help explain the productivity paradox, but it is insufficient for guiding the operations of service firms. To resolve these shortcomings, it is necessary to break the shackles of traditional thinking, redefine service productivity, and select a new scale to measure it. Researchers have formulated new theories about the definition of service efficiency that accounts for the deficiencies of previous theories. Those ideas, which explored a new definition of service productivity, contributed to creating an innovative class that includes both the product principle and the relationship principle. The product principle and the relationship principle are closely related. Each factor in the product principle has its meaning, and each factor is independent of the others. The principle of relation emphasizes the interdependence and interaction of variables. The greatest disadvantage of the related principle is that it does not present a theoretical model (Fließen & Kleinaltenkamp, 2004; Klassen & Rohleder, 2001). The literature review presents a variety of productivity studies, some of which are summarized below:

In 2020, Gumah and Aziabah conducted a study examining how personality and leadership style affect school principals' ability to provide quality educational services. The findings of this study demonstrate a difference between the understanding of efficiency and inefficiency between essential services and the spatial-economic characteristics of citizens. Public services can affect lives when improved through a combination of policy measures, including fighting corruption, improving budgets, increasing oversight, and improving institutional capacity to enhance the physical presence, quality, and visibility of public services (Gumah & Aziabah, 2020). Asadi et al. examined the effect of intellectual capital on job productivity of social emergency workers in the Gilan province, Iran, regarding the role of organizational citizenship behavior in 2020. In our study, structural capital, human capital, and customer capital positively and significantly impact Gilan social emergency staff's organizational citizenship behavior. As part of the next hypothesis, the positive and significant effect of

organizational citizenship behavior on the job performance of the Gilan social emergency staff was also confirmed. According to the study's mediating hypotheses, job productivity was also found to mediate the relationship between the dimensions of intellectual capital and job productivity (Asadi, 2020). A study titled "The Impact of Accountability on Public Service Productivity" asserted that accountability in public organizations is essential to providing efficient public services that strengthen democracy. Analysis of the data revealed a direct relationship between accountability and public service delivery. To improve public service delivery efficiency, the government must ensure accountability in public organizations (Rana et al., 2019). Using the Service Enterprise Productivity in Action (SEPIA) model, Scerri and Agarwal examined and measured service productivity in a study entitled "Productivity of Service Companies in Action," conducted in 2018. It was found that service productivity is a two-step process. Neither the content of the strategy nor the quality of business systems affects service productivity (Scerri & Agarwal, 2018). In 2016, Molebebi Varkani et al. examined the effects of leadership style on productivity innovation of services and processes for the moderating role of knowledge sharing. Results of the hypothesis test show that leadership style impacts productivity innovation in the organization since knowledge sharing plays a moderating role in Mehr Eghtesad Bank branches situated in Mazandaran Province, Iran (Motalebi Varkani et al., 2018).

In 2016, Jalilian and Pajoohesh evaluated the quality of services and their impact on productivity and customer satisfaction in Kermanshah Cooperative Insurance Company. According to the findings of this study, the quality of services (including the five dimensions of reliability, responsiveness, reassurance, empathy) has a positive and significant impact on customer satisfaction and productivity (Jalilian & Pajoohesh, 2018). In 2014, Durdyev et al. examined the factors affecting service industry productivity in a study titled, "Productivity and Quality of Services: Factors Affecting the Service Industry." The study examined both direct and indirect factors. Results indicated that factors such as labor factors (e.g., skills, labor experiences), management clusters (intergroup communication), and procurement factors (e.g., timely delivery) influenced productivity the most (Durdyev et al., 2014). Based on their study in 2013, Adibmanesh et al. investigated the factors affecting the improvement of productivity of Gorgan Municipality services. The results of the correlation analysis of variables indicated a significant and positive relationship between constructive leadership style and productivity.

Additionally, the results of the multiple regression analysis showed that of all the variables considered, extraversion of personality and conscientiousness were the most significant predictors of productivity. This study identifies the personality traits of highly productive managers and can assist in succession planning within an organization. Also, according to the conditions of the time and by implementing productive leadership styles, it is possible to improve the productivity of managers and organizations (AdibManesh et al., 2013).

The study conducted by Bagheri in 2010 examined the factors that influence the productivity of the Gorgan Municipality. By analyzing the means and ratios, the results indicate that the variables of strategy, technology, operations, and customer were effective on the productivity of municipal services, their ineffectiveness being rejected.



The regression analysis results indicated that strategy, with the effect of technology, operations and customers, positively affects the productivity of municipal services in Gorgan and that technology and customers strengthen the effect of operations on improving the productivity of municipal services Gorgan. According to the Friedman test, technology has the greatest impact on Gorgan Municipality's productivity. Customers, strategy, and operations also have the following priorities, respectively. (Bagheri, 2010).

## Research method

There is an application, inference, descriptive study, and the nature of the data is both qualitative and quantitative. This paper follows a three-step process.

A) Our first step involves investigating the library sources to identify the factors that affect productivity management and strategies for improving it within government service organizations. A semi-structured interview was used to collect data for the current study. It is appropriate to state that this study was conducted on two general groups of participants: 1- University experts (Tehran province university lecturers of public administration) and 2- Tehran province government organization managers (with at least ten years of experience managing government organizations). Due to the dominance of the qualitative approach in this section, the theoretical sampling method, which is one of the continuous or sequential targeted sampling methods, was utilized. Theoretical sampling is the process of selecting samples to promote the creation of the theory. Thus, from the range of potential subjects to observe, the researcher selects those who can contribute to creating a theory through enriching the data repository. Instead of selecting a fixed sample, the sample size increases until it reaches a saturation point (BazarganHarandi et al., 2018). Accordingly, after conducting 11 interviews, we found that the main factors and sub-factors were repeated in the interviews and the responses also followed a repetitive pattern. Still, to be sure, four more interviews were conducted, and 15 individuals approved the sample. The interview process was completed, and the researcher reached theoretical saturation. The interviews were then transcribed into text, coded and categorized using NVivo Plus 2020 software, and analyzed.

B) Second, the Shannon Entropy method was used to determine the importance of factors affecting productivity management. When making multi-criteria decisions, it is essential to understand the weight of the elements. To do this, the Shannon Entropy method is employed. The weight of the elements is determined using this method by scattering the values of the elements in question. Stephen Boltzmann first proposed this method, which Shannon quantified (1948). In theory, entropy describes how the most important factors affecting a goal can be estimated or, in other words, it identifies the variables that have the greatest impact on reality.

C) Third, the MABAC was used to rank productivity improvement strategies in government service organizations. The MABAC method is one of the newest techniques for ranking options in multi-criteria decision-making models oposed by (Pamucar & Cirovic, 2015). There are several advantages to using the MABAC method.

1. The mathematical apparatus is simple, and the results are stable.

2. The method can be used to obtain complete results since it considers all possible profit and loss values.

3. The method may be combined with other approaches.

Consequently, the MABAC method can meet the needs of a valid prioritization tool.

Due to their expertise, the statistical population and sampling method are similar in the second and third stages. In addition, the people who participated in the qualitative stage completed the questionnaire for these two phases.

## Findings

Stage 1: To identify factors that affect productivity management in government service organizations and strategies to improve it

We present the results of the initial coding or the open and axial coding in this part of the research. Therefore, their narratives were coded in three levels of concepts, factors, and main categories following the interviews. In the first stage, coding is considered initial coding (concepts) due to its generality and openness. The following step involved secondary coding, in which the primary codes became concept codes (factors) due to a large number of similar categories or the same secondary codes. As a result of selective coding, the factors affecting productivity management and strategies for improving productivity in government service organizations (categories) have been identified. To validate the qualitative results of this study, a members control method has been utilized (the researchers have controlled their findings with five knowledgeable people under study, and the interpretations of the researchers have been confirmed). A summary of the interview analysis is presented in Table 1.

Table 1. Coding interviews and identifying factors affecting productivity management and strategy improvement in government service organizations

Category	Factor	Symbol	Concepts (numbers in parentheses indicate the interviewee number)
Factors affecting productivity management	Accountability	C1	Willingness to help and provide high-level services to citizens (4); Flexibility and investigate complaints (9); Make quick calls without delay after requesting services (12); Online and fast response (13); Responsiveness in social networks (10); Sending valuable information to citizens in the form of newsletters (4)
	Training	C2	Employing trained personnel (12); Development of vocational training in the provision of standard services (14); Acquire new skills and upgrade expertise with the help of training (9); Continuation of in-service courses (10);

Category	Factor	Symbol	Concepts (numbers in parentheses indicate the interviewee number)
			Continuous training of the workforce (1); Providing training related to productivity at work (8)
	Expertise and skill	C3	Employees have sufficient skills and knowledge, and expertise to provide services (7); Updating the knowledge, ability, and expertise of human resources in the organization (5); Ensuring knowledge transfer between employees over time (6); Production of new knowledge by employees and trust-based cooperation (5)
	Experience	C4	Employees' use of past experiences (12); Provide opportunities and incentives for experience and learning (6); Gain new experience by enlarging the job, accepting new responsibilities, and moving to another department (8); Hiring a skilled person and placing people in suitable jobs (10)
	Interdepartmental communication	C5	Ability to communicate easily, regardless of rank and job position (10); Presence of many opportunities for information exchange (12); Ease of contact between people (9); Scheduling meetings with other staff (8); Ease of sharing information with others (8)
	Interdepartmental cooperation	C6	Efforts by different departments to align strategies and goals (8); Interdepartmental cooperation to create internal customer orientation (7); Interdepartmental cooperation to create favorable citizenship behavior in the organization (5)
	Interdepartmental challenge	C7	High stress (5); Absence of synergy and parallelism (11); Goal incompatibility (4); Presence of a large number of Interdepartmental conflicts (5)
	Organizational culture	C8	An organizational culture based on Islamic values (13); Institutionalization of agility culture in the organization (4); Creating commitment in employees (11); Creating a productive culture in the workplace (9); Development of work ethic (5); Creating a culture of



Category	Factor	Symbol	Concepts (numbers in parentheses indicate the interviewee number)
			self-control (7); Creating a spirit of cooperation and problem-solving in the organization and believing in it by managers and employees (9)
	Structure transparency	C9	Setting responsibilities (5); Awareness of responsibilities (5); Transparency and oversight of funding sources (13); Financial transparency and discipline (12); Transparency in Interdepartmental relations (8)
	Leadership style	C10	The head or manager of the organization to promote and support internal customer orientation (7); The head or manager of the organization should clearly define goals (5); Promoting organizational citizenship behavior with transformational leadership (8); The head of the organization sees the mistakes as an opportunity to learn, not to measure them (7); Encouraging employees to engage in extra-role behaviors (6); Applying correct and scientific management style (5)
	Workload	C11	There are so many services to do (1); Performance standards are constantly being improved (15); Service jobs are very laborious (7)
	Safety and health	C12	Efforts to avoid harm and side effects from providing the service (5); Provide technical solutions to prevent work-related accidents (9); Risk identification, risk assessment and suggestion for controlling occupational hazards in the service environment (11); Occupational safety training for employers, employees, and citizens (10); Investigation and measurement of physical and chemical harmful factors of service environment (8); Maintaining physical health and proper nutrition (7)
	Flexibility	C13	Clients in the public service sector want flexibility in enforcing laws and regulations (6); Adaptation to significant and immediate

Category	Factor	Symbol	Concepts (numbers in parentheses indicate the interviewee number)
	Information and Communications Technology	C14	environmental changes (7); Increase dynamics and environmental changes (7); Alternative resources and programs in special circumstances (7) Upgrading IT infrastructure (7); Application of information technology in improving organizational procedures (15); Facilitate the provision of services through the use of information technology (9); Use of powerful and up-to-date information and communication systems (8); Information and communication support of staff (6)
	Research and Development	C15	Establishment of research and development units and the importance of their position (13); Research and development to be used to improve the technical quality and support of software and hardware systems (12); Researching to achieve superior technology and reduce service costs (7)
	Innovation and creativity	C16	Application of innovative technology in expanding the service delivery process (10); Innovation and updating of technology used (7); Innovation in behavior, process, and strategies (8); Support for originality and creativity (13); Promotion of internal innovation and technological transformations in service provider operational units (9)
Productivity improvement strategies	Top managers support	A1	Obligation and practical commitment of managers to improve service efficiency (5); Tangible reflection of the highest levels of support for the organization hierarchy in related organizational policies and plans (7); Full, active, visible support and participation of managers at all levels, especially senior managers (5); Willingness of the organization senior management to make the necessary changes in the current process (6)
	Periodic monitoring	A2	Establish a supervisory committee to guide the efficiency of government services (7); Careful monitoring to

Category	Factor	Symbol	Concepts (numbers in parentheses indicate the interviewee number)
			identify and resolve problems (8); Establishment of service quality control departments (7); Take action to investigate ongoing programs and receive suggestions (4); Present or seasoned presence of senior managers at the service site (9); Monitoring the performance of the organization not only the performance of the individual or individuals (7)
	Design a service efficiency improvement program	A3	Planning to achieve productivity improvements (11); Establish an integrated knowledge-based infrastructure system to improve productivity (4); Develop a model and mechanism for knowledge transfer and localization in the field of productivity (5); Development of a mechanism for measuring the productivity of government services according to the existing complexities (5)
	Improving productivity and service standards	A4	Improving the share of knowledge-based productivity in all activities (8); Focusing productivity on public service activities (7); Organizing the activities of the public service sector to improve productivity (5); Improving service standards and improving the productivity of government services (8); Improving the operational efficiency and effectiveness of the organization in implementing a comprehensive productivity program (4); Cooperation with similar organizations at the international and regional levels to improve productivity (6); Management of motivational tools to improve productivity in activities and service sector activists (8)
	Improve service effectiveness	A5	Focusing service productivity on purpose rather than data alone (5); Improving customer satisfaction and customer or citizen satisfaction (13); Creating a positive attitude and perception of service recipients (12);

Category	Factor	Symbol	Concepts (numbers in parentheses indicate the interviewee number)
	Improve service efficiency	A6	Improving the services provided to the community and customers of the organization (7); Reduce unwanted results in service delivery (8); Increase the amount of positive and stimulus created to use the service (6) A balance between the number of services provided and the consumption budget (9); Balance between service time and cost per unit of service (7); Balance between the number of services provided and the number/hours of employees (12); Balance between the output of services provided and input of capital, equipment, and labor (10); Value-added of capital, labor, equipment used and resources consumed (5)

#### Stage 2: Determine the importance of factors affecting productivity management

To determine the level of importance of factors affecting productivity management in government service organizations, the Shannon Entropy method was used. Thus, after collecting the opinions of 15 experts via questionnaire and summarizing their comments, the following steps were undertaken to analyze the data:

**Step 1: Forming the Decision Matrix:** A five-point Likert scale was used (very low, low, medium, high, and very high). This matrix was created based on the average opinion of experts. This matrix can be formed by evaluating each option to each criterion if the criteria are qualitative or by putting the real number of each evaluation if the criteria are small. A decision matrix is presented in this paper, which contains factors affecting productivity management and options and strategies to improve productivity in government service organizations.

**Step 2: Normalize the decision matrix:** In this step, we normalize the decision matrix, naming each normalized pij accordingly. The normalization process involves dividing the value of each column by the sum of the columns. The first step calculation and the second step calculation results are shown in Table 2.

Table 2. Normalized decision matrix (Unscaled)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	0.119	0.148	0.151	0.132	0.174	0.161	0.157	0.159	0.156	0.160	0.149	0.161	0.150	0.174	0.172	0.154
A2	0.133	0.137	0.141	0.145	0.136	0.140	0.139	0.142	0.157	0.161	0.158	0.153	0.131	0.130	0.147	0.160
A3	0.170	0.163	0.158	0.154	0.156	0.164	0.146	0.160	0.180	0.163	0.163	0.180	0.176	0.175	0.168	0.169
A4	0.191	0.193	0.167	0.180	0.156	0.154	0.170	0.168	0.166	0.160	0.148	0.150	0.184	0.184	0.169	0.168
A5	0.187	0.180	0.176	0.182	0.198	0.190	0.187	0.189	0.178	0.185	0.206	0.172	0.172	0.170	0.169	0.170
A6	0.200	0.180	0.207	0.207	0.180	0.191	0.202	0.182	0.163	0.171	0.177	0.184	0.187	0.168	0.177	0.180

Step 3, Calculate the Entropy of Each Index: The Entropy of  $E_j$  is calculated as follows, and  $k$  holds the  $E_j$  value between 0 and 1 as a constant value.

$$E_j = -k \sum_{i=1}^m P_{ij} \times \ln P_{ij}, k = \frac{1}{\ln m}, i = 1, 2, \dots, m$$

Table 3. Calculation of  $(-kP_{ij} \times \ln P_{ij})$

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	0.141	0.158	0.159	0.149	0.170	0.164	0.162	0.163	0.162	0.164	0.158	0.164	0.159	0.170	0.169	0.161
A2	0.150	0.152	0.154	0.156	0.152	0.153	0.153	0.155	0.162	0.164	0.163	0.160	0.149	0.148	0.157	0.164
A3	0.168	0.165	0.163	0.161	0.162	0.166	0.157	0.164	0.172	0.165	0.165	0.172	0.171	0.170	0.167	0.168
A4	0.177	0.177	0.167	0.172	0.162	0.161	0.168	0.167	0.166	0.164	0.158	0.159	0.174	0.174	0.167	0.167
A5	0.175	0.172	0.170	0.173	0.179	0.176	0.175	0.176	0.171	0.174	0.182	0.169	0.169	0.168	0.168	0.168
A6	0.180	0.172	0.182	0.182	0.172	0.176	0.180	0.173	0.165	0.168	0.171	0.174	0.175	0.167	0.171	0.172

It should be noted that an increase in Shannon Entropy increases uncertainty and decreases information about random variable knowledge. Another interesting aspect of Shannon Entropy is its maximum entropy property for uniform distribution.

Step 4, Calculate the distance of each index from its Entropy (Determining the degree of deviation): Next, the value of  $d_j$  (degree of deviation) is calculated ( $d_j = 1 - E_j$ ), which indicates the amount of useful information does ( $d_j$ ) provide the decision-makers with. The closer the measured values of the index are to each other, the more competing for the options are in terms of that index. Therefore, the role of that index in decision-making should be reduced equally.

Step 5, Determine the weight of each index: Then, the weight value of  $W_j$  is calculated. The standard weight is equal to each  $d_j$  divided by the sum of the  $d_j$ s ( $w_j = d_j / \sum d_j$ ). The results of the fourth and fifth step calculations are shown in Table (4):



Table 4. Calculation of Entropy of each index, degree of deviation, weight, and rank of each index

Indices	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
Entropy of each index (Ej)	0.990	0.996	0.996	0.994	0.996	0.997	0.995	0.998	0.999	0.999	0.996	0.998	0.996	0.997	0.999	0.999
Degree of deviation of each index (Dj)	0.010	0.004	0.004	0.006	0.004	0.003	0.005	0.002	0.001	0.001	0.004	0.002	0.004	0.003	0.001	0.001
Weight of each index (Wj)	0.177	0.071	0.078	0.116	0.071	0.063	0.090	0.043	0.016	0.015	0.070	0.030	0.074	0.057	0.017	0.012
Rank each index	1	7	4	2	6	9	3	11	14	15	8	12	5	10	13	16

According to the results of this section (Table 4), accountability (C1), work experience (C4), interdepartmental challenge (C7), expertise and skill (C3), flexibility (C13), interdepartmental communication (C5), training (C2), workload (C11), structure transparency (C6), information and communication technology (C14), organizational culture (C8), safety and health (C12), research and development (C9), structures transparency (C1), leadership style (C10) and innovation and creativity (C16), respectively, gained the highest degree of importance among the factors affecting the productivity management of government service organizations.

Step 3: Ranking of productivity improvement strategies in government service organizations

In this part of the research, the MABAC method was used to rank the productivity improvement strategies in government service organizations. Accordingly, after obtaining the opinion of experts (15 people) by questionnaire and summary of comments; the following steps were performed to analyze the data:

The first step is to form the initial decision matrix (X): In this step, it is assumed that there are m options and n criteria. Each option is represented by a vector and  $A_{ij} = (x_{i1}, x_{i2}, \dots, x_{in})$ , where  $x_{ij}$  indicates the status of i option in the j criteria. Accordingly, the initial decision matrix is the same as the previous stage matrix (Shannon Entropy). Also,  $x_{ij}$  is the element of the initial decision matrix (X), and  $-x_i$  and  $+x_i$  is defined as follows:

$x_i^+ = \max(x_1, x_2, \dots, x_m)$  represents the maximum value observed in a given criterion among the options.

Table (5) shows the results of the first step calculations.

Table 4. Initial matrix (average response of respondents)

DM	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	2.262	3.033	3.357	2.952	3.595	3.405	3.262	3.429	3.381	3.214	2.881	3.262	2.881	3.857	3.950	3.381
A2	2.533	2.810	3.143	3.238	2.810	2.952	2.881	3.071	3.405	3.233	3.050	3.095	2.524	2.881	3.381	3.524
A3	3.238	3.357	3.524	3.452	3.214	3.476	3.024	3.452	3.905	3.262	3.143	3.633	3.381	3.867	3.857	3.714
A4	3.643	3.967	3.714	4.024	3.214	3.262	3.524	3.619	3.600	3.214	2.857	3.024	3.533	4.071	3.881	3.690
A5	3.571	3.690	3.905	4.071	4.071	4.024	3.881	4.071	3.857	3.714	3.976	3.476	3.310	3.762	3.883	3.738
A6	3.810	3.690	4.595	4.619	3.700	4.033	4.200	3.929	3.524	3.429	3.429	3.714	3.595	3.714	4.071	3.952
X+	3.810	3.967	4.595	4.619	4.071	4.033	4.200	4.071	3.905	3.714	3.976	3.714	3.595	4.071	4.071	3.952
X-	2.262	2.810	3.143	2.952	2.810	2.952	2.881	3.071	3.381	3.214	2.857	3.024	2.524	2.881	3.381	3.381
W	0.177	0.071	0.078	0.116	0.071	0.063	0.090	0.043	0.016	0.015	0.070	0.030	0.074	0.057	0.017	0.012

Step 2, Normalize the Initial Decision Matrix (N): Because each criterion may be different, the Decision Step Matrix is normalized to neutralize the effect of the different scales of the criteria. To do this and according to each criterion, we use  $n_{ij} = \frac{x_{ij} - x_i^-}{x_i^+ - x_i^-}$  )

to normalize the positive criteria and we use  $n_{ij} = \frac{x_{ij} - x_i^+}{x_i^- - x_i^+}$  To normalize negative criteria.

It should be noted that in this paper, the indices of interdepartmental challenge (C7) and workload (C11) were considered as negative criteria. Table (6) shows the results of this step.

Table 6. Normalization of the initial matrix (N)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	0.000	0.498	0.708	0.446	0.862	0.738	0.354	0.754	0.723	0.615	0.600	0.646	0.400	1.031	1.091	0.723
A2	0.175	0.354	0.569	0.631	0.354	0.446	0.600	0.523	0.738	0.628	0.491	0.538	0.169	0.400	0.723	0.815
A3	0.631	0.708	0.815	0.769	0.615	0.785	0.508	0.769	1.062	0.646	0.431	0.886	0.723	1.037	1.031	0.938
A4	0.892	1.102	0.938	1.138	0.615	0.646	0.185	0.877	0.865	0.615	0.615	0.492	0.822	1.169	1.046	0.923
A5	0.846	0.923	1.062	1.169	1.169	1.138	-0.046	1.169	1.031	0.938	-0.108	0.785	0.677	0.969	1.048	0.954
A6	1.000	0.923	1.508	1.523	0.929	1.145	-0.252	1.077	0.815	0.754	0.246	0.938	0.862	0.938	1.169	1.092

Step 3: Formation of a weighted normal decision matrix (V): Since the criteria have different weights in the evaluation process; in this step, the values of the weighted normal matrix must be calculated based on the relation ( $v_{ij} = w_i(n_{ij} + 1)$ ). In this relation,  $n_{ij}$  are the elements of the normal matrix (N), and  $w_i$  is the standard weight  $i$ .  $v_{ij}$  also forms the elements of the weighted matrix V. This matrix is defined as follows:

Table 7. Formation of a weighted matrix (V)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	0.177	0.106	0.133	0.168	0.132	0.109	0.122	0.076	0.028	0.024	0.113	0.050	0.104	0.115	0.035	0.021
A2	0.208	0.096	0.122	0.190	0.096	0.090	0.145	0.066	0.028	0.024	0.105	0.047	0.087	0.079	0.028	0.022
A3	0.288	0.121	0.141	0.206	0.115	0.112	0.136	0.077	0.033	0.024	0.101	0.057	0.128	0.115	0.034	0.023
A4	0.335	0.149	0.151	0.249	0.115	0.103	0.107	0.081	0.030	0.024	0.114	0.045	0.135	0.123	0.034	0.023
A5	0.327	0.136	0.161	0.252	0.154	0.134	0.086	0.094	0.033	0.028	0.063	0.054	0.124	0.111	0.034	0.024
A6	0.354	0.136	0.195	0.294	0.137	0.134	0.068	0.090	0.029	0.026	0.088	0.059	0.138	0.110	0.036	0.025

Step 4, Specify the Area Estimation Boundary Matrix (G): The area estimation boundary for each criterion is calculated as  $g_i = (\prod_{j=1}^m v_{ij})^{1/m}$ . After calculating  $g_i$  for each criterion, the boundary estimation matrix of the area, denoted by G, is formed, as shown in Table (8):

Table 8. Area boundary estimation matrix (geometric mean of each column of the weighted matrix)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
gi	2.082	0.662	0.868	1.536	0.668	0.584	0.563	0.362	0.091	0.069	0.470	0.195	0.626	0.551	0.105	0.063

Step 5, Calculate the distance of the options from the area estimation boundary (Q): The distance of the options from the area estimation boundary is determined according to the relation  $Q = V - G$ , equal to the difference between the weighted matrix elements (V) and the value of the area estimation boundary (G). After determining the value of the Q matrix, the status of each option can be determined by defining the area estimation vector (G), the upper area limit (+ G), and the lower area limit (-G). Accordingly, the  $A_i$  option belongs to the community of the set. These areas are shown in Figure 1. In this definition, the upper limit of the area estimate (+ G) is the area where the ideal option (+ A) is present, and the lower limit of the area estimate (-G) is the area where the anti-ideal option (-A) is located. The extent to which the  $A_i$  option belongs to the community is obtained from the following equation.

$$A_i \in \begin{cases} G^+ q_{ij} > 0 \\ G q_{ij} = 0 \\ G^- q_{ij} < 0 \end{cases}$$

Based on the logic of the MABAC method, for  $A_i$  to be the best option in the set of options, it needs to be closer to the upper limit of the (G +) area estimation than the other options. In other words, if the value is  $0 < q_{ij}$ , then the  $A_i$  option will be close to or equal to the ideal option. The same problem exists in reverse for the conditions  $q_{ij} < 0$ . So if  $q_{ij} < 0$ , then the  $A_i$  option is close to or equal to the anti-ideal option. Table (9) shows this step's results.

Table 9. Calculate the distance of options from the estimation boundary (Q)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.905	0.556	0.735	1.368	0.536	0.476	0.441	0.286	0.063	0.046	0.357	0.146	0.522	0.436	0.070	0.042
A2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.874	0.566	0.745	1.347	0.572	0.494	0.419	0.296	0.063	0.045	0.365	0.149	0.539	0.472	0.076	0.041
A3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.793	0.541	0.726	1.331	0.553	0.473	0.427	0.285	0.058	0.045	0.369	0.138	0.498	0.436	0.071	0.039
A4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.747	0.513	0.717	1.288	0.553	0.481	0.456	0.281	0.061	0.046	0.356	0.150	0.491	0.428	0.071	0.039
A5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.755	0.526	0.707	1.284	0.514	0.451	0.477	0.268	0.059	0.041	0.407	0.141	0.502	0.440	0.071	0.039
A6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.728	0.526	0.672	1.243	0.531	0.450	0.496	0.272	0.062	0.044	0.382	0.137	0.488	0.441	0.069	0.037

Step 6, Ranking Options: In the last step of the MABAC method, the value of the criteria functions is calculated based on the sum of the options distances from the area estimation vector ( $q_i$ ) for each, is calculated according to the relation  $S_i = \sum_{j=1}^n q_{ij}$ . By calculating the sum of the elements of the Q matrix in a row, the final value of the standard functions for each option is determined as the basis for ranking the options.

Table 10 - Ranking of options

Rank	Options		si
1	Improve service efficiency	A6	-7.58
2	Improve service standards	A4	-7.68
3	Improve service effectiveness	A5	-7.68
4	Design a service efficiency improvement program	A3	-7.78
5	Top managers support	A1	-7.98
6	Periodic monitoring	A2	-8.06

## Conclusions and suggestions

The concept of productivity is often defined in terms of efficiency and effectiveness. The difference between efficiency and effectiveness can be described simply by emphasizing that productivity relates to doing the right things, whereas effectiveness means doing the right thing. Improvements in the effectiveness of government service organizations may result in improved customer satisfaction and citizen satisfaction, a positive attitude and perception among service recipients, improved services provided to the community and customers, reduced unwanted results, and increased motivated consumers as a result of the positive experience. As a result of improving the efficiency of services, the result expected is also guided by factors like the balance between the number of services provided and the consumption budget, the balance between the length of the services and the cost of each service unit, the balance between the number of services and the staffing levels, the balance between capital inflows, equipment, and labor, and maximizing the value-added of capital, labor, equipment, and resources consumed. We used interviews to collect data and information for qualitative analysis in the present study. Data were coded following the interviews. A total of 102 items were obtained from the text of the interviews as basic concepts, which were classified into 21 sub-indices and two major indices. Second, the Shannon Entropy method was used to determine the importance of productivity management factors in the second stage. The questionnaires were analyzed after obtaining the opinions of 15 experts. As a final step, productivity improvement strategies in government service organizations were ranked using the MABAC method. The research results indicated that improving service quality, improving service standards, improving service effectiveness, designing a program to improve service productivity, and top management support ranked highest among the productivity improvement strategies for government service organizations. Accordingly, it is recommended to government service organizations:

- Provide full, active, tangible support and participation of all managers, especially senior managers, with a real commitment by managers to improve service quality and tangible evidence of the support of the highest levels of the organization hierarchy in related organizational policies and plans.

- Provide close oversight to identify and eliminate production problems and obstacles by establishing a supervisory committee to guide public service productivity and establish service quality control departments.
- Use the speed and accuracy of providing services to citizens, achieving the set standards and modifying service processes, and the use of communication technology at a higher level and better quality information to improve processes.
- Establish an improvement in service productivity by creating an integrated system of knowledge-based infrastructure to improve productivity and formulating a mechanism for measuring the productivity of government services, given the existing complexities.
- To improve citizens' satisfaction, consider citizen-centeredness and attention to the quality and quantity of service, recognizing citizens' expectations of services, considering the personal preferences and individual values of service recipients, and meeting citizens' expectations.

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